APPENDIX – Market Barriers to Deploying Clean Energy Technologies (ETAAC)

Potential Barriers to the Commercialization and Deployment of Low and Zero Greenhouse Gas Technologies

Cost and Market Barriers		
External Benefits	Frequency- **high** Severity- **high**, in some cases considered medium	External benefits of GHG-reducing technologies that are not available to the owners of the technologies, as well as other environmental benefits and employment & other spill-over economic benefits are examples.
Up-Front Capital Costs	Frequency – **high** Severity - **high**	Up-front capital costs are higher for the production and purchase of many zero and low-carbon technologies. While capital costs are often repaid over time, lack of access to capital and short term planning by industries, small businesses, and households can compound this barrier. Capital-intensive demonstrations may be particularly challenging.
Demonstration Costs & Risks	Frequency – **high**/med Severity- **high**/med	Technologies in the development & demonstration phase may have higher capital cost, higher labor/operating cost, increased downtime & lower reliability, lack of standardization, and/or lack of engineering, procurement and construction capacity. Private investments in reducing this costs & risks through demonstration projects may be disincentivized by benefits that can be shared by competitors.
Market Demand	Frequency – med/**high** Severity- med/**high**	Customers may be risk/change-adverse; "chicken and egg" dilemma of low demand for emerging technologies prior to full commercialization may inhibit production at scale necessary to achieve full commercialization.
Misplaced Incentives	Frequency- medium Severity-medium (in some cases considered low or high)	Misplaced incentives occur when the buyer/owner is not the consumer/user (e.g., landlords and tenants in the rental market and speculative construction in the buildings industry) – also known as the principal-agent problem.
Information Barriers		
Incomplete and Imperfect Information	Frequency- **high/** med Severity- med/**high**	Lack of information about technology performance (especially trusted information), increased decision-making complexities, and cost of gathering and processing information about new technologies are potential barriers. This barrier may be compounded to the extent that shared benefits of customer education are a distinctive for private investments.
Lack of Specialized Knowledge	Frequency – med/**high** Severity- in some cases considered low, med, and **high**	Inadequate workforce training/expertise, cost of developing a knowledge base for available workforce, and inadequate reference knowledge for decision makers are examples.

Categories developed from Oak Ridge National Laboratory Report "Carbon Lock-in, Barriers to Deploying Climate Change Mitigation Technologies", Dr. Marilyn Brown et. al as revised January 2008; February 2008 ETAAC report; ETAAC April & June 2009 meetings

ETAAC Review of Potential Barriers to the Commercialization and Deployment of Low and Zero Greenhouse Gas Technologies		
Government Barriers		
Unfavorable Standards	Frequency- med Severity- med (in some cases considered **high**)	Standards that "grandfather" existing infrastructure and facilities; programs that operate in "silos" rather than integrating relevant concerns such as air quality, climate change, and energy security; and rules granting access to water rights and other resources on a "first come first served" basis can create barriers.
Uncertain Standards	Frequency – med Severity- med	Examples of uncertainty about future regulations of greenhouse gases including emission levels, potential GHG emission subsidies through free GHG allowances allocations, and ownership/liability of underground sequestered carbon.
Unfavorable Fiscal Policy	Frequency – med Severity – med (in some cases considered low)	Fiscal policies that slow the pace of capital stock turnover; state and local variability in fiscal policies such as tax incentives and property tax policies; distortionary tax subsidies that favor conventional energy sources and high levels of energy consumption are potential barriers.
Uncertain Fiscal Policy	Frequency – med (in some cases considered **high**) Severity- med (in some cases considered **high**)	Short-duration tax & fiscal policies (such as production tax credits); uncertainty over future costs for GHG emissions; market-development oriented incentive programs with uncertain lifespan & funding levels are examples.
Unfavorable Approval Processes	Frequency – med Severity – **high** (in some cases considered med)	Approval processes may favor incumbents if agencies lack familiarity & established processes for new technologies such as carbon capture and sequestration and off-shore energy development. Permitting/approval procedures serving valuable public purposes that apply to new but not existing facilities & infrastructure may favor incumbents that are grandfathered, especially when approval processes are not coordinated.
Uncertain Approval Processes	Frequency – med Severity – med/**high**	Uncertain timing and outcome of approval processes may be a potential barrier.

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Industry Structure & Infrastructure Barriers		
Existing Infrastructure "Lock-in"	Frequency- med/**high** (even split) Severity- med/**high** (even split)	Existing large investments such as long-term power and transportation fuels production and distribution infrastructure can "lock-in" existing technologies.
Lack of Needed Infrastructure for New Technology	Frequency – **high**/med Severity-**high**	Renewable electricity transmission capacity, alternative transportation energy supply distribution, and other infrastructure needs are examples. Lack of manufacturing facilities and distribution/supply channels and other supply chain shortfalls can also be a barrier.
Incumbent Industry Market Dominance	Frequency- **high** , in some cases considered low and med Severity-mostly **high,** in some cases considered low	Natural monopolies or large incumbents with market power may disenable technological innovation to prevent disruption of existing profitable markets & investments.
Industry Segmentation or Fragmentation	Frequency- med Severity- med/low	Industry segmentation can inhibit change. For instance, manufacturing a single long-haul truck is often split among independent engine, chassis, and body manufacturers segments, with a variety of manufacturers within each segment. Small business owners may be harder to reach with information about new energy efficiency technologies, especially as their needs often vary based on business type.
Intellectual Property	Frequency-med Severity-low/med	High transaction costs for patent filing and enforcement, conflicting views of a patent's value, and techniques such as patent warehousing, suppression, and blocking can create barriers.